



DEPARTMENT OF NATURAL RESOURCES  
WATER PROTECTION PROGRAM  
WATER QUALITY MONITORING AND ASSESSMENT SECTION  
WATERSHED INFORMATION SHEET

## Thompson River Basin-10280102

### Basin Description

The Thompson River originates in southern Iowa and flows almost due south through north central Missouri to its confluence with the Grand River near Chillicothe. The Missouri portion of the basin has an area of 1,105 square miles. The major tributaries include the Weldon River and Muddy, Honey and No creeks. The largest reservoir in the basin is Lake Paho with a surface area of 273 acres. Mercer Reservoir and Ridgeway Lake serve as public drinking water supply sources.

Average annual rainfall ranges from 36 inches in the northern part of the basin to 38 inches in the south. Stream flow statistics for the basin are shown in Table 1.

Table 1. Stream Flow Statistics for Thompson River Basin

Stream/Location	Watershed Area (sq.mi.)	Period Of Record	Flow (cfs)				
			90 <sup>th</sup> Percentile *	Mean	Median **	10 <sup>th</sup> Percentile ***	7Q10 Low Flow+
Thompson R. @ Trenton	1,670	1928-2004	2,320	1,011	210	29	2.6
Muddy Cr. @ Trenton		1962-67					0.0
Weldon R. nr. Trenton		1961-67					1.8
Honey Cr. nr. Trenton		1962-67					0.0

\* Flow is less than this amount 90 percent of the time

\*\*Flow is less than this amount 50 percent of the time

\*\*\*Flow is less than this amount 10 percent of the time

+ The lowest average seven consecutive day flow that occurs with a recurrence interval of 10 years.

The Thompson River basin lies with the Dissected Till Plains physiographic province. The land is a mixture of hills and plains. Fifty-three percent of the land is pasture and hayfields, 31 percent is row crop and 15 percent forest.

Except for limited areas where streams may have incised Pennsylvanian aged rock, the surface of the basin is glacial till overlain by loess. Glacial till is a mostly unsorted mixture of clay, sand, gravel and rock debris created and pushed southward into Missouri by the great glacial ice sheets. Loess is a windblown silt deposit. Depth of the till is highly variable but is generally less than 200 feet. Loess deposits are generally 4-8 feet in depth. Cyclical (repetitive) deposits of sandstone, siltstone, shale, limestone and coal of Pennsylvanian age underlie these glacial deposits.

The presence of the clayey till and the underlying shale and coal beds insure that there is very little movement of water to the subsurface. Most water movement in the basin is through the surface stream network. Water that reaches the subsurface will resurface locally when a stream valley incises a confining aquatard (an impermeable layer). There are only two small spring of note in basin and these probably cease flowing in dry weather. Since very little water infiltrates to the subsurface, streamflow can be very high during wet weather. For the same reason, base flows, streamflow sustained only by the re-emergence of groundwater into the stream, are very low during the intervening dry periods.

## **Water Quality Concerns**

Acceptable water quality is defined by Missouri's Water Quality Standards [<http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf>] . Streams or lakes that do not meet these standards are considered "impaired". They may not be fit for certain uses such as swimming, drinking water supply or protection of fish and other aquatic life. Waters are considered to be "affected" rather than "impaired" if water quality changes are less serious and state standards are not exceeded. These standards also list more than 3,600 classified streams and more than 400 classified lakes in the state. A classified stream is one that is either a permanently flowing stream or one that may stop flowing in dry weather but still maintains large pools of water that support aquatic life. Unclassified streams are the small tributaries to classified streams that typically have flowing water only during wet weather and are dry for the remainder of the year.

Water Quality in Prairie Streams

<http://www.dnr.mo.gov/env/wpp/watersheds/info/wq-prairie-str.pdf>

Aquatic Habitat in Prairie Streams

<http://www.dnr.mo.gov/env/wpp/watersheds/info/aquatic-hab-prairie-str.pdf>

## **Point Source Pollution**

Point source pollution is a discharge of wastewater from a single location such as a wastewater treatment plant. Wastewater treatment plants can serve industries, small businesses, subdivisions, mobile home parks, apartment complexes, or entire cities. Wastewater from residential sources such as subdivisions, apartments and mobile home parks is often referred to as "domestic wastewater" and contains primarily treated human wastes, food wastes and detergents. The primary pollutants of concern in domestic wastewater are the amount of organic matter, which is commonly reported as Biological Oxygen Demand (BOD), suspended solids, and ammonia. Industrial and commercial wastewater can be more complex and may contain, in addition to domestic wastes, heavy metals or man-made organic chemicals that can be potentially toxic. Discharges from most municipal wastewater treatment plants are usually a mixture of domestic and industrial/commercial wastewater. Most wastewater plant discharges are also typically

high in nitrogen and phosphorus, two elements that act as fertilizers and can cause excessive algae growth in waters receiving these discharges.

There are 8 permitted domestic or industrial/commercial point sources that discharge a combined 1.86 million gallons per day (mgd) of treated wastewater into the waters of the Thompson River basin. The 1.4 mgd wastewater discharge from the City of Trenton is largest wastewater discharge in the basin. There are 383 miles of classified streams in the basin. Only 0.1 miles (less than one-tenth of one percent) are known to be affected or impaired by point source wastewater discharges. There are also 1.4 miles of unclassified streams that are affected or impaired by point source wastewater discharges.

#### Wastewater Treatment

<http://www.dnr.mo.gov/env/wpp/watersheds/info/wastewater-treatment.pdf>

### **Nonpoint Source Pollution**

Nonpoint source pollution occurs when pollutants are released from numerous points. They that are often spread out and difficult to identify and control. In the Thompson River basin, the most serious nonpoint problem is degradation of aquatic habitat. A total of 383 miles (100 percent) of classified streams in the basin are considered to have degraded aquatic habitat. The lack of infiltration of rainfall, when combined with local soil tillage and other land uses leads to a large amount of surface runoff during wet weather. This contributes to soil erosion and high levels of sediment deposition in streams. The quality of aquatic habitat is further impaired by removal of wooded riparian vegetation, and by the channelization, or straightening, of streams. Channelization has occurred in 125 miles (33 percent) of streams in the basin.

Storm water runoff in the Midwest can carry significant amounts of fertilizers, animal wastes, and pesticides into streams. Atrazine is an agricultural herbicide used on corn and grain sorghum that is commonly found in stormwater. Missouri's water quality standards allow no more than 3.0 ug/l Atrazine in drinking water reservoirs as a long-term average. There are two reservoirs in the Thompson River basin that serve as drinking water supplies. Water in Ridgeway Lake has been monitored prior to treatment and the long term average Atrazine level in the lake is 0.38 ug/l. There has not been sufficient monitoring of Mercer Reservoir to determine a meaningful average for that lake.

Finished drinking water is monitored regularly at all public supplies. Finished drinking water in Missouri has been found to meet state standards for pesticides. Levels of Atrazine in finished drinking water supplies may be significantly lower than the amounts found in the reservoirs if the drinking water plants take measures to reduce Atrazine during the water treatment process.

Drinking water reservoirs throughout northern and western Missouri are also monitored for several other common agricultural herbicides. Results of this monitoring over many years indicates that the only other herbicide that may be a human health concern in drinking water reservoirs is Cyanazine. Cyanazine has not been a problem in Ridgeway Lake, and federal regulations require the end of all Cyanazine use in 2002.

Groundwater can also be affected by nonpoint source pollution. In northern and western Missouri, some public water supplies and many private water supplies come from groundwater. While public groundwater supplies are routinely tested and protected, many private wells are not. Studies of water quality of private wells in northern and western Missouri show that about one third of wells exceed the drinking water standard for nitrate. And about two percent exceed drinking water standards for pesticides. Local land use practices or surface contamination of the wellhead often causes this contamination. It does not represent widespread contamination of the underground aquifer. Deeper aquifers are protected from surface contamination by impermeable strata.

During warm weather when stream flows are low, livestock tend to gather in and around streams. The wastes they leave in the water contributes to nuisance algae growths, low levels of dissolved oxygen and elevated levels of ammonia and bacteria.

## **Water Quality Management**

The department achieves water quality management of point source pollutants through the issuance and enforcement of wastewater discharge permits. These permits limit the amount of pollutants that can be discharged. All point source wastewater dischargers must obtain a permit and adhere to its discharge limitations. All permits require at least a level of treatment equal to national wastewater treatment standards. In situations where these national treatment standards are not adequate to protect the streams or lakes receiving these wastewater discharges, stricter permit limits that do protect these waters are required. The permits require regular monitoring and reporting of discharge quality. The department also conducts regular inspection of wastewater treatment facilities and receiving waters.

Nonpoint source pollution is addressed through the state's nonpoint source management plan. This plan is a cooperative program between the Department of Natural Resources and other federal, state and local government agencies or organizations, local landowners and other interested citizens. The plan emphasizes addressing problems at the watershed level through the use of management practices that control nonpoint pollution. The most commonly supported practices are those that control soil erosion on agricultural and urban lands, improve quality and quantity of forage on grazing lands, protect riparian zones, and those that control runoff of animal manure, fertilizers and pesticides. The state nonpoint source management plan is a voluntary program that provides funds to help defray the cost of adopting management practices.

Since 1990, there have been 15 nonpoint source watershed projects in the basin. Twelve of these have been funded by state sales tax money earmarked for soil and water conservation. One project was funded primarily through federal Clean Water Act funds. These projects treated more than 26,000 acres of land, comprising about 4 percent of the entire basin.

Table 3. Nonpoint Source Watershed Projects in the Thompson River Basin

Watershed Name	County	Project Date	Watershed Size (Acres)	Acres Treated	Percent of Watershed Treated
Tombstone Cr.	Harrison Daviess	1990-94	12,800	3,676	29%
Middle Cr.	Grundy	1990-94	4,000	2,284	57%
Trail Cr.	Harrison	1990-94	17,300	3,991	23%
Wildcat Cr.	Mercer	1993-97	3,250	947	29%
Sugar Cr.	Harrison	1994-98	19,020	5,700	30%
Irwin Cr.	Mercer	1994-98	6,410	2,224	35%
No Cr.	Grundy	1995-99	20,996	1,654	8%
Crooked Cr.	Grundy	1995-99	6,289	1,408	22%
Brush Cr.	Mercer	1995-99	6,700	1,989	30%
West Muddy Cr.	Mercer	1993-99	19,360	640	3%
Raccoon Cr.	Grundy Daviess	2000-05			
Sugar Creek	Harrison	1998-05			
Honey Creek	Mercer	2002-09			
Hickory Creek	Grundy	2005-10			
Muddy Creek	Mercer	2005-12			

The Missouri Department of Natural Resources monitors water chemistry and aquatic invertebrate communities at many locations in Missouri. The department also tracks the quality of domestic, industrial and storm water discharges. These monitoring activities provide information on water quality problems, such as their specific location, pollutants, sources and possible solutions. This information guides the management activities the department takes to protect water quality in Missouri.

### Web links

US Geological Survey

<http://mo.water.usgs.gov/>

Kansas City District Corps of Engineers

<http://www.nwk.usace.army.mil/>

Missouri Department of Conservation

<http://www.mdc.mo.gov/fish/watershed/grand/140cotxt.htm>

US Environmental Protection Agency

<http://www.epa.gov/region7/water/index.htm>